veeVERNUF stockSENSE

2022 issue 3

In this issue:

Intervet South Africa (Pty) Ltd.

Reg. Nr. 1991/006580/07
Spartanweg 20, Spartan, 1619, RSA
Privaatsak X2026, Isando, 1600, RSA
Tel +27 (0) 11 923 9300
Faks +27 (0) 11 392 3158
Verkope Faks +27 (0) 86 603 1777

www.msd-animal-health.co.za
ZA-NON-220300005

IMPORTANT TRACE MINERAL SUPPLEMENTATION IN RUMINANTS

Dr Clinton Austin

Introduction

Collectively speaking, minerals make up less than 5 % of the animal body[1], however their functional importance in various physiological and metabolic functions is considerable.

Trace mineral nutrition supports immunity, growth and reproduction in livestock[2], and available forage, water and ingested soil are the primary source of such minerals.

Although a mineral rich country, many parts of South Africa ironically find the soil and herbage deficient in certain important minerals such as copper, zinc, manganese and selenium[1], resulting in the need for trace mineral supplementation in South African livestock.

Mineral supplements available on the South African market come in different forms including premixes, free choice loose mineral mixes, mineral salt blocks, oral drenches and injectable preparations amongst others. Although all the above-mentioned methods of supplementation are widely accepted and practised, injectable supplements and the minerals they contain will be discussed here.

The function of minerals

Broadly speaking, the function of minerals can be divided into four main categories[3]:

1. Physiological functions which include the minerals that occur in body fluids and tissues, such as electrolytes, are involved in regulating acid-base balance, blood pressure and transmission of nerve signals amongst others.
2. Structural functions such as the formation of the bones and teeth.
3. Regulatory functions where certain minerals are involved in regulating cell division, signal transduction and the production of hormones.
4. Catalytic functions where minerals act as catalysts in certain enzyme and hormone systems or form specific components of metalloenzymes.

The above broad functions can all be deemed essential to homoeostasis as well as optimal health and wellbeing. In any ruminant production system, these functions will underpin the three pillars of successful livestock farming: production, reproduction and immunity.

Trace minerals support many functions related to growth and immunity[2] and since growth, milk production and disease incidence (directly related to immunity) have a direct influence on profitability, it would be logical to infer that trace mineral nutrition management is essential in any dairy or calf/lamb growing operation. Trace mineral imbalances require the animal to compensate metabolically which may result in depressed performance resulting from reduced forage intake, lowered immunity, poor feed conversion and lower daily gains[4].

One of the most significant factors affecting profitability in ruminants is reproductive efficiency[5] and a number of trace minerals are vital in ensuring optimal reproductive performance. Fertility is affected by nutrition in that specific nutrients are required for development of oocytes and spermatozoa, ovulation, fertilization, survival of the embryo and pregnancy establishment[6].

Fertility is also indirectly affected by its impact on hormones and other nutrient sensitive metabolites that are required for these processes. Even marginal or subclinical deficiencies of certain minerals can impair reproductive efficiency significantly. Minerals important in reproduction include copper, manganese, zinc, selenium and chromium[5,7,8].

Advanced Supplementation

MICROMIN B

Reg. No. G4382 (Act 36/1947)
Contains chromium 5 mg/mℓ, copper 7,5 mg/mℓ, manganese 10 mg/mℓ, zinc 40 mg/mℓ and selenium 5 mg/mℓ.

MICROMIN O

Reg. No. G4384 (Act 36/1947)
Contains manganese 10 mg/mℓ, zinc 40 mg/mℓ, selenium 3 mg/mℓ.

Cu COPPER

Copper has for a long time been of known importance for ruminant production[9,10] and is strongly influenced by dietary factors and other minerals including zinc, molybdenum and sulphur. Copper is important in the formation of metalloenzymes such as super-oxide dismutase, lysyl oxidase, ceruloplasmin and cytochrome oxidase amongst others[10], making copper critical in bodily functions such as cellular respiration, neurotransmitter function, free radical defence, tissue synthesis as well as cardiac and blood vessel integrity[11].
Low copper levels, or hypocuprosis, are often associated with female reproductive disorders, commonly resulting in embryonic loss and pre-natal mortality[12]. Symptoms of deficiency usually occur post-natally in cattle and in-utero in sheep[7], and although low copper levels in forage alone does not appear to have a significant effect on fertility, when the copper deficiency is combined with high molybdenum levels, cow fertility is adversely affected[13].

Copper is essential for development of the central nervous system of the embryonic lamb and studies have shown a high correlation between maternal and foetal copper levels[7]. Lesions due to copper deficiency are a common finding on pastures with high molybdenum content[10] but this trend can be reversed by supplementing copper[13].

Copper also modulates host immunity by its involvement in the development and differentiation of immune cells, as well as providing anti-fungal properties at a cellular level[14]. The mechanisms are complex but copper appears to be involved in progenitor cell differentiation of monocytes, as well as being concentrated in phagosomes and providing anti-bacterial bombardment[15,16].

Zn ZINC

Zinc is notable because it is involved in a large number of biological process including cell proliferation, immune function as well as management of free radicals[17]. Zinc has an important function in skin and claw integrity due to its role in the formation of keratin[18]; it is not stored in the body and a constant supply is required to prevent deficiencies, which may lead to conditions such as parakeratosis, slowed growth, lethargy and reduced immunity to disease[19].

Zinc has long been recognized as essential in normal reproductive functioning in males and females[12]. It plays an important role in the transcription of hyaluronic acid, which in turn makes up an essential component of the cumulus-oocyte complex in mammalian follicles[17]. Zinc is also essential for the formation of superoxide dismutase, an enzyme responsible for protecting cells (including oocytes) from damage caused by free radicals. Zinc deficient lambs show decreased spermatogenesis in lambs due to atrophy of the seminiferous tubules[12], while zinc deficient calves were found to have significantly smaller testes.

Zinc functions as a modulator in the immune system[20] and this function is highly dependent on the availability of zinc. The immune system is very proliferative and particularly susceptible to zinc deficiency, which affects the survival, proliferation and differentiation of cells involved in both innate and adaptive immunity, including monocytes, polymorphonucleocytes, as well as natural killer-T- and B-cells. In the innate immune system, insufficient zinc levels lead to a decrease in chemotaxis by polymorphonucleocytes[21], as well as a decrease in phagocytosis[22]. In the adaptive immune system, many cytokine dependent functions of T-cells are regulated by zinc and insufficient zinc levels may lead to thymic atrophy and subsequent T-cell lymphopaenia[23].

Mn MANGANESE Co COBALT

Manganese is involved in many of the same processes as copper and zinc, while cobalt is essential for the production of vitamin B12 or cobalamin[4], an important component of enzymes used in metabolic reactions.

In gestating ruminants, manganese deficiency adversely affects the developing embryo[7] and impacts on normal development of epiphyseal cartilage in the foetus. In 2003 McDowell demonstrated reduced conception rates in cattle and sheep fed manganese deficient diets[24] and male lambs receiving inadequate manganese demonstrated reduced testicular growth[25].

Cr CHROMIUM

Chromium plays an important role in enhancing the effect of insulin which affects daily nutrient metabolism. It has also been shown to enhance antibody reactions to vaccines in cattle fed supplemental chromium[26]. Both factors will contribute strongly towards optimal production.

Chromium plays a role in optimal fertility by improving immune function, reducing tissue mobilization as well as reducing levels of non-esterified fatty acids. The incidence of retained placenta is often higher in immune-impaired cows[27], which will negatively impact measures of fertility. Chromium also plays a vital role in insulin metabolism[8] and there is evidence that this metabolic hormone plays a role in ovarian follicular development as well as the release of luteinizing hormone, through its role in glucose metabolism.

The effects of chromium on the immune system has been difficult to elucidate, with the results of numerous studies being rather inconsistent[28]. In 2003, Faldyna et al. demonstrated an enhanced antibody response in cattle injected with a Clostridium tetani vaccine[26], but it is postulated that the effect of chromium on immunity is more indirect through its effect of reducing serum concentrations of cortisol, a well-known immune suppressant[29].

Se SELENIUM

Selenium status of the animal influences growth rates because of its involvement in the metabolism of thyroid hormones[30]; a deficiency of selenium causes a decrease in the blood triiodothyronine (T_3) to tetraiodothyronine (T_4) ratio, slowing down growth due to the relative decrease in T_3.

Selenium deficiencies in ruminants have been associated with higher incidence of reduced fertility, retained placentas, mastitis and metritis[30]. In human males, selenium deficiency is also known to inhibit normal testosterone and spermatozoan synthesis[31], whilst also reducing spermatozoan motility[32]. Along with zinc and cobalt, selenium supplementation has been shown to improve sperm motility, percentage of live sperm and sperm membrane integrity in lambs[33,34].

Selenium is notable for its role in the formation of various leukocytes including Natural Killer cells, Helper T-cells and Cytotoxic T-cells[30]. This becomes important in the incidence of diseases commonly problematic in dairy animals such as mastitis, where the functioning of phagocytic and cytotoxic cells is of primary importance. Selenium supplementation has also been shown to induce a higher level of IgG antibodies in dam serum and colostrum[35], which resulted in higher serum IgG levels in the calf.

Supplementation

Malnutrition and mineral deficiencies in particular have long been recognized as a cause of poor performance and disease in production animals[7,36,37], both of which have a detrimental effect on the profitability of a farming enterprise. Ensuring optimal trace mineral levels in production animals has been shown to support production[2,28,38], reproduction[17,39] and immunity[26,40,41] in ruminants.

It stands to reason that increasing the mineral status of an animal when biological needs are increased, such as growing or breeding, would be advantageous[39] – this can be achieved by giving supplements. However, supplementation requires considerable amounts of planning and expert knowledge, as simply supplementing excess amounts of all necessary minerals will not lead to optimal production and may even be deleterious. This is because interactions between various minerals can affect their relative levels in the body, particularly in ruminants[10,42]. These same minerals, many of which are co-factors in enzymes controlling free radicals in the body, may become pro-oxidants when consumed or administered in excess.

Injecting trace minerals into ruminants is advantageous compared to oral dosing in that the gastrointestinal tract is bypassed, thereby avoiding antagonists and competition for absorption[43]. Injecting trace minerals also provides a targeted and specified dose of minerals to individual animals[2,39], eliminating the variability in voluntary intake in cattle provided access to free choice minerals[44].

Commercially available injectable trace mineral supplements for cattle and sheep vary in content but generally contain various combinations of zinc, manganese, copper, chromium and selenium, the benefits of which were discussed earlier.

Mineral interactions and safety

Daily mineral requirements for cattle are widely published and available, but it must be stressed that these are minimum required concentrations in feed. Injectable mineral supplements should not be considered a replacement for good quality feed, but rather as a "top-up" designed to boost mineral levels during times of stress or additional need.

Although it is possible to cause toxicity by over-dosing certain minerals, the levels of these minerals within well-known and commercially available injectable supplements are far below the Maximum Tolerance Levels (MTL) stated in Table 1.

Interactions between minerals must also be taken into account, as many minerals are able to positively or negatively affect levels of other minerals[10,42]. A common example is the relationship between copper, molybdenum and sulphur discussed earlier in this article. When using mineral supplements, it is important to consider any mineral excesses which may occur naturally in a specific area; this is because if animals have high levels of a specific mineral, supplementation may push levels to toxic levels.

Conclusion

Trace mineral supplementation is essential in many areas to support optimal levels of production in ruminants. Symptoms of deficiencies are not often obvious, frequently manifesting as insidious, non-specific signs related to decreased production, negatively affected fertility and disease occurrence (immunity).

It is important to seek expert advice when designing a supplementation program, which considers management practises, type of enterprise, species, as well as regional or local mineral levels in water, soil and herbage. Frequency of supplementation should also be carefully considered, taking into account therapeutic versus strategic supplementation at critical times in the production cycle, in order to ensure that financial benefit accrues from use of any particular supplement.

Table 1: Maximum tolerance levels in supplementation of cattle and sheep[45]

Element	Maximum Tolerance Levels in Cattle (mg/kg)
Copper	40
Chromium (soluble)	100
Manganese	2 000
Selenium	5
Zinc	500

References:

1. Boyazoglu PA. Animal Nutrition: Concepts and Applications. Van Schaik; 1997.
2. Arthington JD, Moriel P, Martins PGMA, Lamb GC, Havenga LJ. Effects of trace mineral injections on measures of performance and trace mineral status of pre- and postweaned beef calves. J Anim Sci. 2014;92(6):2630-2640. doi:10.2527/jas.2013-7164
3. Underwood EJ. The Mineral Nutrition of Livestock. CABI; 1999.
4. Paterson JA, Engle TE. Trace mineral nutrition in beef cattle. In: Nutrition Conference Sponsored by University of Tennessee. ; 2005.
5. Spears JW. Trace minerals and reproduction in ruminants. Salt Inst Newsl. Published online 2014.
6. Robinson JJ, Ashworth CJ, Rooke JA, Mitchell LM, McEvoy TG. Nutrition and fertility in ruminant livestock. Anim Feed Sci Technol. 2006;126(3):259-276. doi:10.1016/j.anifeedsci.2005.08.006
7. Hidiroglou M, Knipfel JE. Maternal-fetal relationships of copper, manganese, and sulfur in ruminants. A review. J Dairy Sci. 1981;64(8):1637-1647.
8. Kafilzadeh F, Shabankareh HK, Targhibi MR. Effect of Chromium Supplementation on Productive and Reproductive Performances and Some Metabolic Parameters in Late Gestation and Early Lactation of Dairy Cows. Biol Trace Elem Res. 2012;149(1):42-49. doi:10.1007/s12011-012-9390-0
9. Ammerman CB. Recent Developments in Cobalt and Copper in Ruminant Nutrition: A Review. J Dairy Sci. 1970;53(8):1097-1107. doi:10.3168/jds.S0022-0302(70)86353-6
10. Suttle NF. The interactions between copper, molybdenum, and sulphur in ruminant nutrition. Annu Rev Nutr. 1991;11:121-140. doi:10.1146/annurev.nu.11.070191.001005
11. Riaz, M, Muhammad G. Copper deficiency in ruminants in Pakistan. Matrix Sci Medica. 2018;2(1):18-21. doi:10.26480/msm.01.2018.18.21
12. Hidiroglou M. Trace Element Deficiencies and Fertility in Ruminants: A Review. J Dairy Sci. 1979;62(8):1195- 1206. doi:10.3168/jds.S0022-0302(79)83400-1
13. Phillippo M, Humphries WR, Lawrence CB, Price J. Investigation of the effect of copper status and therapy on fertility in beef suckler herds. J Agric Sci. 1982;99(2):359-364. doi:10.1017/S0021859600030148
14. Li C, Li Y, Ding C. The Role of Copper Homeostasis at the Host-Pathogen Axis: From Bacteria to Fungi. Int J Mol Sci. 2019;20(1):175. doi:10.3390/ijms20010175
15. Khera D, Sharma B, Singh K. Copper deficiency as a cause of neutropenia in a case of coeliac disease. Case Rep. 2016;2016. doi:10.1136/bcr-2016-214874
16. Wagner D, Maser J, Lai B, et al. Elemental Analysis of Mycobacterium avium-, Mycobacterium tuberculosis-, and Mycobacterium smegmatis-Containing Phagosomes Indicates Pathogen-Induced Microenvironments within the Host Cell's Endosomal System. J Immunol. 2005;174(3):1491-1500. doi:10.4049/ jimmunol.174.3.1491
17. Anchordoquy J, Anchordoquy J, Sirini M, Picco S, Peral-García P, Furnus C. The Importance of Having Zinc During In Vitro Maturation of Cattle Cumulus-Oocyte Complex: Role of Cumulus Cells. Reprod Domest Anim. 2014;49(5):865-874. doi:10.1111/rda.12385
18. Bauer Benjamin U, Rapp C, Mülling Christoph KW, Meissner J, Vogel C, Humann-Ziehank E. Influence of dietary zinc on the claw and interdigital skin of sheep. J Trace Elem Med Biol. 2018;50:368-376. doi:10.1016/j. jtemb.2018.07.026
19. Ianni A, Innosa D, Martino C, Grotta L, Bennato F, Martino G. Zinc supplementation of Friesian cows: Effect on chemical-nutritional composition and aromatic profile of dairy products. J Dairy Sci. 2019;102(4):2918- 2927. doi:10.3168/jds.2018-15868
20. Bonaventura P, Benedetti G, Albarède F, Miossec P. Zinc and its role in immunity and inflammation. Autoimmun Rev. 2015;14(4):277-285. doi:10.1016/j.autrev.2014.11.008
21. Ibs K-H, Rink L. Zinc-Altered Immune function. J Nutr. 2003;133(5):1452S-1456S. doi:10.1093/jn/133.5.1452S
22. Sheikh A, Shamsuzzaman S, Ahmad SM, et al. Zinc Influences Innate Immune Responses in Children with Enterotoxigenic Escherichia coli-Induced Diarrhea. J Nutr. 2010;140(5):1049-1056. doi:10.3945/ jn.109.111492
23. King LE, Frentzel JW, Mann JJ, Fraker PJ. Chronic Zinc Deficiency in Mice Disrupted T Cell Lymphopoiesis and Erythropoiesis While B Cell Lymphopoiesis and Myelopoiesis Were Maintained. J Am Coll Nutr. 2005;24(6):494-502. doi:10.1080/07315724.2005.10719495
24. McDowell LR. Minerals in Animal and Human Nutrition.; 2003: Accessed February 17, 2020. https://www. cabdirect.org/cabdirect/abstract/20053041640
25. Masters DG, Paynter DI, Briegel J, Baker SK, Purser DB. Influence of manganese intake on body, wool and testicular growth of young rams and on the concentration of manganese and the activity of manganese enzymes in tissues. Aust J Agric Res. 1988;39(3):517-524. doi:10.1071/ar9880517
26. Faldyna M, Pechova A, Krejci J. Chromium Supplementation Enhances Antibody Response to Vaccination with Tetanus Toxoid in Cattle. J Vet Med Ser B. 2003;50(7):326-331. doi:10. 1046/j.1439-0450.2003.00680.
27. Kimura K, Goff JP, Kehrli ME, Reinhardt TA. Decreased neutrophil function as a cause of retained placenta in dairy cattle. J Dairy Sci. 2002;85(3):544-550. doi:10.3168/jds.S0022-0302(02)74107-6
28. Lashkari S, Habibian M, Jensen S. A Review on the Role of Chromium Supplementation in Ruminant Nutrition—Effects on Productive Performance, Blood Metabolites, Antioxidant Status, and Immunocompetence. Biol Trace Elem Res. 2018;186(2):305-321. doi:10.1007/ s12011-018-1310-5
29. Depew CL, Bunting LD, Fernandez JM, Thompson DL, Adkinson RW. Performance and Metabolic Responses of Young Dairy Calves Fed Diets Supplemented with Chromium Tripicolinate. J Dairy Sci. 1998;81(11):2916- 2923. doi:10.3168/jds.S0022-0302(98)75853-9
30. Mehdi Y, Dufrasne I. Selenium in Cattle: A Review. Molecules. 2016;21(4):545. doi:10.3390/ molecules21040545
31. Rayman MP. Selenium and human health. The Lancet. 2012;379(9822):1256-1268. doi:10.1016/S0140- 6736(11)61452-9
32. Maiorino M, Flohé L, Roveri A, Steinert P, Wissing JB, Ursini F. Selenium and reproduction. BioFactors. 1999;10(2-3):251-256. doi:10.1002/biof.5520100224
33. Anderson JM, Axford RFE, Ap Dewi I. The effect of selenium supplementation on fresh and frozen ram semen. In: Proceedings of the British Society of Animal Science. Vol 1996. Cambridge University Press; 1996:185-185.
34. Kendall N, McMullen S, Green A, Rodway R. The effect of a zinc, cobalt and selenium soluble glass bolus on trace element status and semen quality of ram lambs. Anim Reprod Sci. 2000;62(4):277-283.
35. Hefnawy AEG, Tórtora-Pérez JL. The importance of selenium and the effects of its deficiency in animal health. Small Rumin Res. 2010;89(2):185-192. doi:10.1016/j. smallrumres.2009.12.042
36. McDowell LR. Mineral Nutrition History, the Early Years. First Edition Design Publishing; 2017. https://search. ebscohost.com/login.aspx?direct=true&db=edsebk&AN=1800389 &site=eds-live&scope=site
37. Weiss WP. A 100-Year Review: From ascorbic acid to zinc—Mineral and vitamin nutrition of dairy cows. J Dairy Sci. 2017;100(12):10045-10060. doi:10.3168/jds.2017-12935
38. Mallaki M, Norouzian M, Khadem A. Effect of organic zinc supplementation on growth, nutrient utilization,and plasma zinc status in lambs. Turk J Vet Anim Sci. 2015;39:75-80. doi:10.3906/vet-1405-79
39. Stokes RS, Volk MJ, Ireland FA, Gunn PJ, Shike DW. Effect of repeated trace mineral injections on beef heifer development and reproductive performance. J Anim Sci. 2018;96(9):3943-3954. doi:10.1093/jas/sky253
40. Arthington JD, Havenga LJ. Effect of injectable trace minerals on the humoral immune response to multivalent vaccine administration in beef calves. J Anim Sci. 2012;90(6):1966-1971. doi:10.2527/jas.2011- 4024
41. Teixeira AGV, Lima FS, Bicalho MLS, et al. Effect of an injectable trace mineral supplement containing selenium, copper, zinc, and manganese on immunity, health, and growth of dairy calves. J Dairy Sci. 2014;97(7):4216-4226. doi:10.3168/jds.2013-7625
42. Goff Jesse P. Invited review: Mineral absorption mechanisms, mineral interactions that affect acid-base and antioxidant status, and diet considerations to improve mineral status. J Dairy Sci. 2018;101(4):2763- 2813. doi:10.3168/jds.2017-13112
43. Pogge D, Richter E, Drewnoski M, Hansen S. Mineral concentrations of plasma and liver after injection with a trace mineral complex differ among Angus and Simmental cattle. J Anim Sci. 2012;90(8):2692–2698.
44. Arthington J, Swensont C. Effects of trace mineral source and feeding method on the productivity of grazing Braford cows. Prof Anim Sci. 2004;20(2):155-161.
45. National Research Council. Mineral Tolerance of Animals: Second Revised Edition, 2005. National Academies Press; 2006. https://books.google.com/books?id=UTva4Zbh_8UC

LATEST DEVELOPMENTS IN CATTLE RESPIRATORY DISEASE

Dr Caroline Brits

Bovine Respiratory Disease (BRD) also known as Bovine pneumonia is a disastrous lung condition that affects cattle of all ages.

The disease has considerable economic consequences to feedlots or farms that assemble large groups of cattle from diverse origins. BRD is responsible for the highest mortality rate in cattle of all ages, the only exception being young calves. (Campbell, 2022)

Bovine Respiratory Disease is a multifactorial condition, where stress and management play a vital role. The occurrence of respiratory disease is dependent on 3 integral factors:

1. **Environmental conditions:**

   Weaning, transport of cattle or rapid changes in weather conditions, serve as stressors which adversely affects the animal's immune system, making them more susceptible to infection. In addition, certain environmental factors such as overcrowding or inadequate ventilation can enhance the transmission of infection among animals. (Campell, 2022)

2. **Animal factors:**

   The efficiency of the animal's immune system is dependent on numerous elements, from the quality and amount of colostrum received to the age and immune status of the animal. Colostral immunity acquired from the mother is depleted from 3 months of age and the calf's immune system and lungs are only fully developed from 12 months old, making them more susceptible to infection during this time. (Campell, 2022)

3. **Infectious Agents:**

   Numerous pathogens are involved with BRD ranging from viral, bacterial and even parasites. In most circumstances more than one pathogen can be isolated, some causing the initial insult (usually viruses) and others merely opportunistic.

The four most common viral causes:

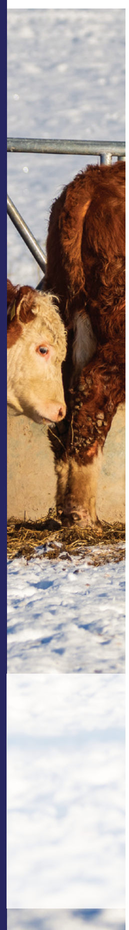
- Bovine Respiratory Syncytial Virus
- Bovine Infectious Rhinotracheitis Virus
- Parainfluenza type 3 Virus
- Bovine Viral Diarrhoea Virus

Most common parasite cause:

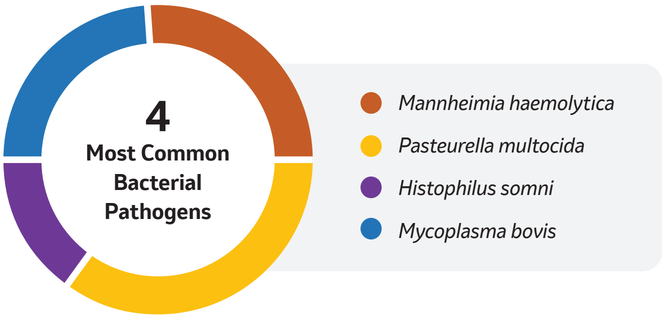
- Lungworm

The four most important bacterial causes:

- *Mannheimia haemolytica*
- *Pasteurella multocida*
- *Histophilus somni*
- *Mycoplasma bovis*



In the most recent survey from Dr Maryke Henton, tracheal aspirates were obtained from cattle across South Africa during 2021. These samples were cultured to highlight the prevalence of the top four bacterial agents associated with BRD.



Histophilus somni is a normal inhabitant of the upper respiratory tract, however it is being increasingly recognized as an important pathogen in BRD. (Janzen, 2020) *Histophilus somni* migrate and colonise lungs that have decreased defences i.e., when the animals are highly stressed such as weaning or after damage has been caused by an invasion of a primary pathogen. The organism can spread through the blood to various organs, affecting their blood supply which may lead death. (Janzen, 2020)

Various methods of control can be established on a farm to ensure that one minimises the risk of exposure as well as increase immunity to Bovine Respiratory Disease.

1. Strict biosecurity measures

- Avoid introducing infected animals into the herd as well as quarantining newly introduced animals.
- Maintaining strict hygiene practice.

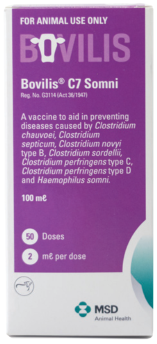
2. Minimal and low stress handling of cattle

3. Vaccines should be applied as part of an overall control program. Where their main function will be to improve immunological responses by decreasing transmission rates and severity of clinical disease. Bovilis Vista Once SQ combined with the new Bovilis Vista C7 Somni provides the most comprehensive respiratory cover for viruses and bacteria.

Understanding the factors that contribute to the disease as well as the appropriate measures one can take to avoid infection and transmission on the farm, will bring a farmer one step closer to economic stability and humane animal farming.

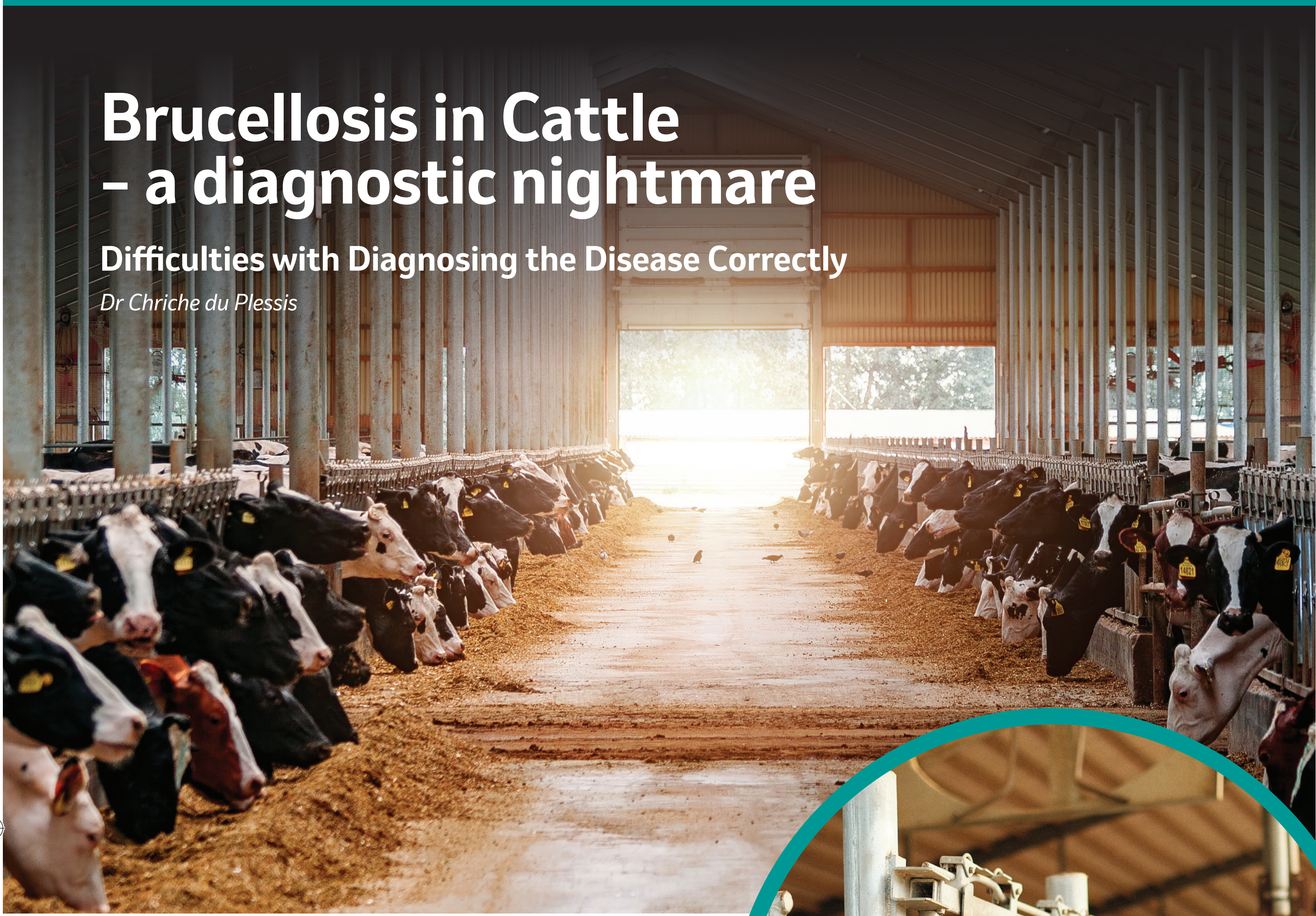
Bovilis® Vista Once SQ Reg. No. G4061 (Act 36/1947). Contains modified live cultures of bovine rhinotracheitis (IBR) virus, bovine virus diarrhoea (BVD) virus (type 1 and 2), parainfluenza 3 virus (PI3), bovine respiratory syncytial virus (BRSV) and avirulent live cultures of *Mannheimia haemolytica* and *Pasteurella multocida*.

Bovilis® Vista C7 Somni Reg. No. G3114 (Act 36/1947). A vaccine to aid in preventing of diseases caused by *Clostridium chauvoei*, *Clostridium septicum*, *Clostridium novyi* type B, *Clostridium sordellii*, *Clostridium perfringens* type C, *Clostridium perfringens* type D and *Haemophilus somni*.



References

Anon., 2022. Bovine Respiratory Disease. [Online]
Available at: https://www.msd-animal-health.ie/species/cattle/bovine-respiratory-disease/
Campbell, J., 2022. MERCK MANUAL Veterinary Manual. [Online]
Available at: https://www.merckvetmanual.com/respiratory-system/respiratory-diseases-of-cattle/bovine-respiratory-disease-complex
Campell, J., 2022. MERCK MANUAL Veterinary Manual. [Online]
Available at: https://www.merckvetmanual.com/respiratory-system/respiratory-diseases-of-cattle/bacterial-pneumonia-in-cattle
Janzen, E. D., 2020. Histophilosis. [Online]
Available at: https://www.merckvetmanual.com/generalized-conditions/histophilosis/histophilosis
[Accessed 23 May 2022].
Janzen, E. D., 2022. MERCK MANUAL Veterinary Manual. [Online]
Available at: https://www.merckvetmanual.com/generalized-conditions/histophilosis/histophilosis



Brucellosis in Cattle – a diagnostic nightmare

Difficulties with Diagnosing the Disease Correctly

Dr Chriche du Plessis

As *Brucella* organisms hide away in the cells of the body and are only in the bloodstream for a very short period of time, tests to pick up the organism itself are very difficult to perform.

We have to rely on tests that pick up the presence of the organism in the body. These we call antibody tests. Antibodies are the body's first line of defence against infection.

Antibodies are formed by the immune system when a foreign organism enters the body. When the immune system is functioning optimally, antibodies play an important role in clearing infections. Once the animal is healthy and free of the infecting organism, antibodies remain in the bloodstream attesting to the presence of a past infection. In stress conditions such as under-nutrition, internal parasite infection and sometimes even pregnancy, this defence mechanism is compromised.

Brucella antibodies share characteristics with the antibodies of some other organisms such as *Salmonella* and *E. coli*. This may result in false positive tests thus impacting on the interpretation of results when performing the Milk Ring Test.

When we vaccinate an animal, the body has the same reaction as it would have against a natural infection. In some cases, as with the S19 vaccine strain, this antibody reaction can be prolonged interfering with *Brucella* screening tests. In the case of the RB51 vaccine strain no antibodies are detected following vaccination. The antibodies tested for in serology (blood) tests are not produced after vaccination with the RB51 vaccine strain, hence serology tests remain negative. However should a vaccinated animal be challenged by a field strain, the body will react and antibodies will be formed, resulting in positive tests despite vaccination.

It is thus extremely difficult to interpret test results accurately based on an isolated sample and without the full herd vaccination history. To determine if an animal is infected requires repeated testing. Your State Veterinarian will advise on the different tests needed to confirm a positive diagnosis.

The Tests Available

Milk Ring Test

In dairies the most commonly used test is the Milk Ring Test. This is routinely done on the bulk milk tank. The test is extremely sensitive. That means that it can have the potential for testing a lot of negative herds positive. It can be compared to the saying – for every bit of smoke there is a fire. The Milk Ring Test picks up all the smoke signals even if there isn't a raging veld fire. These smoke signals can be the result of a 'braaivleis' or your neighbour smoking.

The Milk Ring Test tests for antibodies against *Brucella* present in the milk and can detect antibodies in the bulk milk tank even when as few as 1 or 2 cows in a 700 cow milking herd are infected with *Brucella*. False positive results could be due to cows with a high somatic cell count contributing to the bulk milk tank, such as cows with mastitis, colostrum or late lactation milk.

Culture

Culture of *Brucella* organisms is the definitive test confirming an infection. In the early stages of an infection a blood sample can be taken to try and culture the bacteria in the blood. This is extremely difficult and more often than not the test will not give the desired result.

Culture is used more successfully on any aborted material and lymph node biopsies taken after a positively tested cow has been slaughtered. Milk and udder tissue can be used for culturing as well. Culture tests can take up to 2 weeks to show any growth.

Serum Agglutination Tests

For these tests, blood is taken and sent to the laboratory. These tests are only done on individual animals. The laboratory uses the serum of the animal to test for antibodies. They use a special solution that they mix with the serum.

If there are antibodies in the blood it will bind to the solution and a colour reaction will occur. Even though it sounds simple these tests are technically very difficult to perform.

Two of these tests, the RBT (Rose Bengal Test) and CFT (Complement Fixation Test) are the most commonly performed in South Africa. The RBT is like the Milk Ring Test, it sees all the smoke signals. The CFT then weeds out all the smoke signals to see the real veld fires.

One other test exists, namely the Brucellin Skin Test. It is similar to a TB (tuberculosis) test but is not currently available or allowed in South Africa. As is evident from the above, brucellosis testing is not as clear cut as one would like.

There are numerous factors taken into account before an animal/herd is eventually declared positive. However, due to the importance of the disease each positive test should be thoroughly investigated. Ignoring smoke signals could result in a devastating raging fire.

DIE ERNS VAN VERANTWOORDELIKE ANTIBIOTIKA-VERBRUIK

Dr De Wet Barnard

'n Klein persentasie selle in enige bakteriële populasie dra gene wat aan hulle die vermoë bied om die effek van antibiotikas teë te staan (genoem antimikrobiale weerstand of AMW gene).

Hierdie gene kan óf vertikaal oorgedra word aan afstammelinge wanneer bakterieë verdeel en vermeerder, óf horisontaal na ander bakteriële selle in die populasie (eenvoudig gestel, bakterieë kan AMW gene na beide hulle afstammelinge én na hulle bure oordra).

Normaalweg is die bakterieë met AMW gene nie baie gehard nie en word "uitgeboer" deur bakterieë sonder AMW gene. Maar wanneer antibiotikas onverskillig en onverantwoordelik gebruik word roei dit die bakterieë wat nié AMW gene het nie uit en laat 'n populasie bakterieë met AMW gene oor, wat dan onverpoos kan vermeerder en hierdie gene in die omgewing versprei. Die enigste manier om die toename in AMW gene te bekamp is deur verantwoordelike antibiotika verbruik.

Verantwoordelike verbruik van antibiotika begin deur te verstaan wat antibiotikas is, waarom, en hoe om dit aan te wend. In die mees algemene gebruik van die woord is antibiotika 'n medikasie wat gebruik word om bakteriële infeksies te behandel. Die doel van antibiotika is dus om patogeniese bakterieë dood te maak of te keer dat hulle vermeerder in die liggaam. Vir virale siektes soos bek-en-klouseer, knopvelsiekte of stywesiekte sal 'n antibiotika dus nie werk nie, tensy daar 'n sekondêre bakteriële infeksie is.

Antibiotikas kan ook nie been-, spier- of ligament-beserings behandel nie; hiervoor het mens 'n anti-inflammatoriese middel nodig wat flunixin meglumine bevat. Té veel moes ek al hoor hoe 'n klient 'n antibiotika gespuit het vir 'n bees met 'n besering waar daar nie 'n oop of penetrerende wond met 'n sekondêre infeksie is nie. Hierdie ongegronde en ondeurdagte gebruik van antibiotikas lei tot die toename en verspreiding van bakterieë met AMW gene.

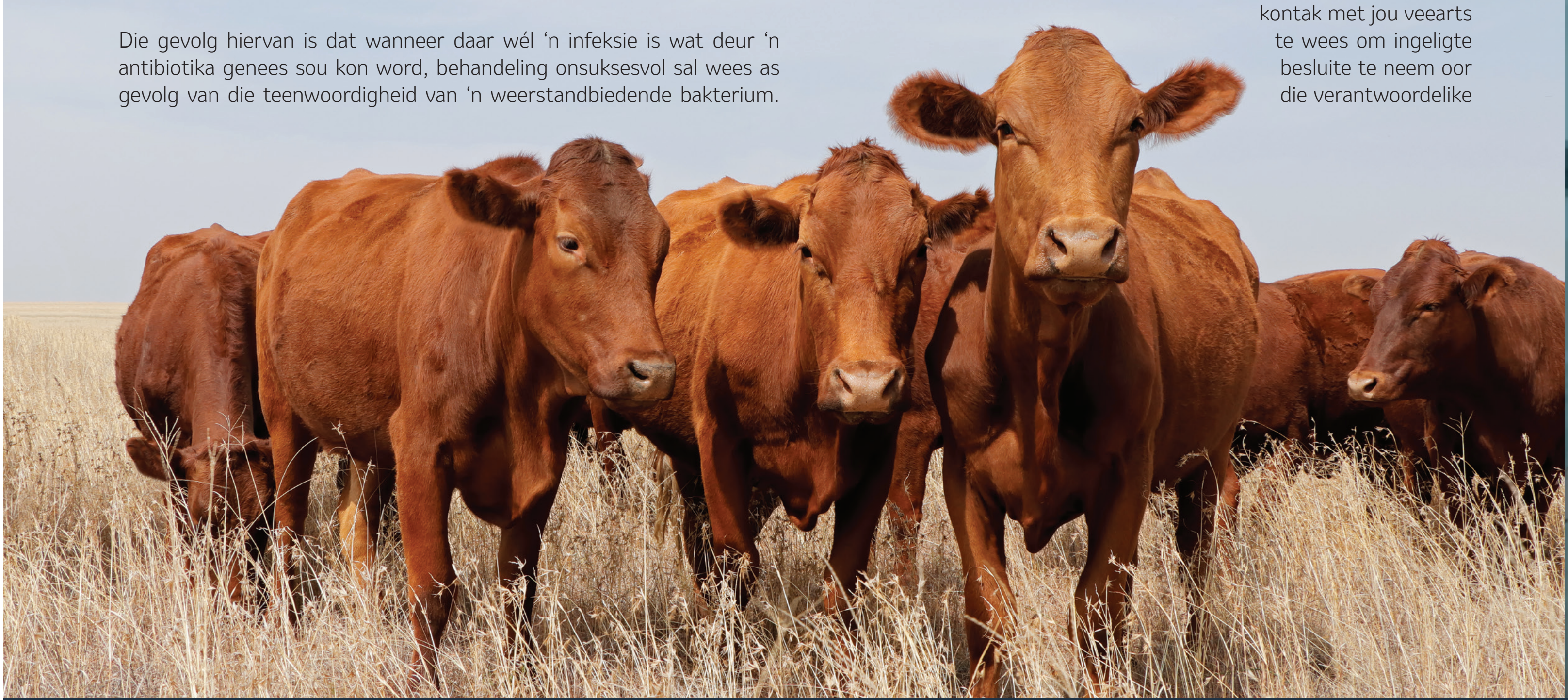
Die gevolg hiervan is dat wanneer daar wél 'n infeksie is wat deur 'n antibiotika genees sou kon word, behandeling onsuksesvol sal wees as gevolg van die teenwoordigheid van 'n weerstandbiedende bakterium.

Die ander groot bekommernis is dat hierdie AMW gene uiteindelik na mense kan versprei, hetsy deur direkte kontak met diere óf deur residue in diere-produkte.

Antimikrobiale weerstand is aan die toeneem. 'n 2021 studie waaraan MSD deelgeneem het van antimikrobiale weerstand in die bakterieë wat bees respiratoriese siekte veroorsaak in voerkrale het getoon dat weerstand toeneem in veral die tetrasiklien en makrolied groep van antibiotikas. Die probleem is, daar is 'n beperkte aantal klasse van antibiotikas, en die kans is skraal dat nuwe klasse in die aansienbare toekoms beskikbaar gaan word. Dit kos biljoene rande en dekades se navorsing om nuwe medisinale middels op die mark te bring, en dis nie realisties om te verwag dat ons in die afsienbare toekoms 'n nuwe, effektiewe antimikrobia op die rakke gaan sien nie.

Dis onus rus dus op die verbuikers van antibiotikas om die effektiwiteit daarvan te beskerm. Dit is belangrik om te onthou dat die werking van hierdie middels 'n komplekse veld is en dat daar steeds vrae is rondom die interaksies tussen antibiotika, pasiënt en bakterieë. Antibiotikas word verdeel in twee breë groepe: Sidies, wat bakterieë doodmaak, en staties, wat keer dat bakterieë verdeel en vermeerder en sodoende die liggaam se eie immuniteit kans gee om sélf die bakterieë dood te maak. Mens kan uiteraard nie 'n sidiese en 'n statiese antibiotika kombineer nie, aangesien hulle meganismes van aksie mekaar teëwerk. Maar hoe antibiotika in 'n liggaam reageer teen 'n infeksie en hoe dit in 'n petribakkie in 'n laboratorium optree verskil soms. Mens kan sekere klasse antibiotikas ook nie sáám gebruik of binne 'n sekere tydperk van mekaar toedien nie.

Om hierdie rede is dit dus krities belangrik om altyd in kontak met jou veearts te wees om ingeligte besluite te neem oor die verantwoordelike



gebruik van antibiotika. Meeste antibiotikas word gereguleer onder Wet 101 van 1965, wat beteken dat die gebruik van hierdie middels met die voorskrif en onder die toesig van 'n veearts aangewend moet word. Maar selfs met antibiotikas wat gereguleer word onder Wet 36 van 1947 en nié 'n veearts voorskrif nodig het nie (soos bv Reverin en Disulfox L.A) is dit belangrik dat u veearts weet wanneer, hoé en waarom hierdie middels gebruik word.

Faktore wat in ag geneem moet word is:

- spesie indikasie,
- rede vir toediening (bv respiratoriese siekte of spierweefsel infeksie)
- roete van toediening (bv binnespiers, binne-aars of onderhuids),
- aantal kere wat antibiotika toegedien moet word (bv eenmalig of 1x per dag vir 'n aantal dae),
- tyd wat antibiotika effektief in die liggaam is en, verál belangrik,
- onttrekkingsperiodes.

Sekere antibiotikas is ook lewensgevaarlik vir mense en moet met groot sorg toegedien word.

As hierdie alles kompleks en intimiderend klink: Dit ís! Een van die beste maniere om antibiotika verantwoordelik te gebruik is om dit nie hoéf te gebruik nie. Onthou, antibiotika is nie 'n bestuurspraktyk nie maar 'n laaste maatstaf wanneer alle ander voorsorgmaatreëls gefaal het.

Die behoeftes aan antiobiotika verbruik kan beperk word deur 'n paar basiese maatreëls te volg:

- 'n Effektiewe entingsprogram kan 'n groot aantal infeksies voorkom.
- Weldeurdagte diere-hanteringsfasiliteite kan beserings en die risiko van sekondêre infeksies beperk.
- Goeie higiëne kan die verspreiding van patogene beperk. Die bakterium wat bv. absesse veroorsaak, *Trueperella pyogenes*, is baie gehard en kan lank in die omgewing oorleef. 'n Abses wat oopgesny is en dreineer het in 'n drukgang kan bv. maklik lei tot bakterium wat sy pad in die longe in van die volgende bees kan bevind as die drukgang nie deeglik skoongemaak en ontsmet word voor die volgende dier weer mee gewerk word nie.

Deur hierdie basiese beginsels van enting, bestuur en higiëne te volg kan die gebruik van antibiotika beperk word, wat sal lei tot beide 'n aansienlike kostebesparing sowel as om die risiko van die toename in antimikrobiale weerstand te beperk.

REVERIN 135 Reg. No. G3432 (Act 36/1947). Namibia Reg. No. V04/17.1.2/552 NS0
Contains 135 mg oxytetracycline per *mℓ*.
REVERIN LA 230 Reg. No. G3521 (Act 36/1947).
Contains 230 mg oxytetracycline hydrochloride (23 % *m/v*).
DISULFOX L.A. Reg. No. G3212 (Act 36/1947). Namibia Reg. No. V00/17.1.7/649 NS0
Contains sodium sulphadimethoxine 40 % *m/v*.

References:

1. Research Synthesis: Costs of Pharmaceutical R&D, v1.0 researched and written by Marcela Vieira, edited by Suerie Moon, last updated January 2020
2. BOVINE RESPIRATORY DISEASE. 2021 analysis. Marijke M Henton
3. Association between antimicrobial drug class for treatment and retreatment of bovine respiratory disease (BRD) and frequency of resistant BRD pathogen isolation from veterinary diagnostic laboratory samples. Johann F. Coetzee , Drew R. Magstadt, Pritam K. Sidhu, Lendie Follett, Adlai M. Schuler, Adam C. Krull, Vickie L. Cooper, Terry J. Engelken, Michael D. Kleinhenz, Annette M. O'Connor. Published: December 13, 2019, https://doi.org/10.1371/journal.pone.0219104

MSD ANIMAL HEALTH

Promotion!

Place your orders with your MSD Agent to the value of R10 000 or more and you stand a chance to

win 1 of 25 genuine leather belts

Make sure your herd is fully protected!

Fluxacur®

G3202 (Act 36/1947)

Solution® 3.5% L.A.

G3689 (Act 36/1947)

Ralgro®

G1406 (Act 36/1947)

Berenil® R.T.U

G2702 (Act 36/1947)

Respiravax®

G3867 (Act 36/1947)

Covexin®

G3354 (Act 36/1947)

DeleteAll®

G2837 (Act 36/1947)

Taktic®

G2535 (Act 36/1947)

Immunovite

V24724 (Act 36/1947)

Micromin B

G4382 (Act 36/1947)